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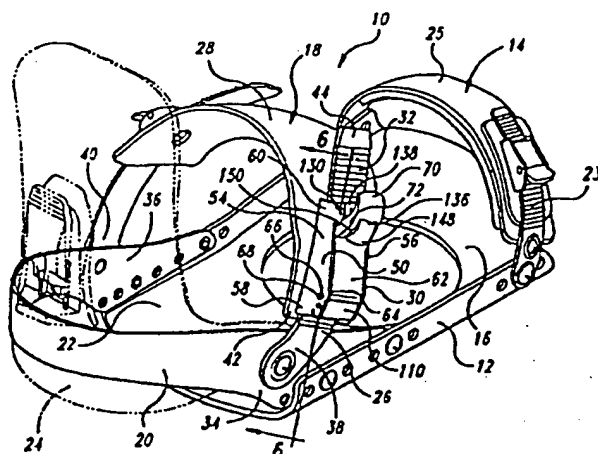
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(54) Title: SNOWBOARD BINDING ASSEMBLY



(57) Abstract

An ankle strap (18) on a snowboard binding assembly frame (12) has first and second strap portions (26, 28) removably interconnected. The first strap portion (26) includes ratchet teeth (32), and a buckle (30) attached to the second strap portion (28) receives the first strap portion (26). The buckle (30) includes a bracket (50) on the second strap portion (28), a lever (62) pivotally connected to the bracket (30), and a dog member (84) pivotally connected to the lever (62) engaging one or more teeth (32). The dog member (84) is movable between a retracted position when the lever (62) is raised and an advanced position when the lever (62) is lowered. The dog member (84) engages one of the teeth (32) and moves from the retracted position toward the advanced position as the lever (62) is lowered to tighten the ankle strap (18). A pawl (110) pivotally attached to the bracket (50) engages one of the ratchet teeth (32) as the lever (62) is lowered.

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Description

SNOWBOARD BINDING ASSEMBLY

5 Technical Field

The present invention is directed toward a snowboard, and more particularly, toward a snowboard binding assembly for securely retaining a boot of a snowboarder on the snowboard.

10 Background of the Invention

Snowboards have, or are adapted to have, binding assemblies mounted to the board's top surface. The binding assembly releasably retains a boot of a snowboarder in the binding to allow the snowboard to remain attached to the snowboard and to facilitate control and turning of the snowboard during use.

- 15 Snowboard bindings include soft-boot bindings and hard-boot bindings. The conventional soft-boot binding has a frame attached to the snowboard. The frame receives a flexible boot worn by the snowboarder within the binding, and straps are positioned across the top of the boot in order to retain the boot within the binding. The straps are adjustable to allow the binding to be snugly tightened onto snowboard boots
- 20 of different sizes and with a force selectable by the snowboarder.

- The straps on the snowboard binding must be easy to operate and adjust in a wide variety of conditions, such as when a snowboarder is wearing gloves and standing in a ski lift line, or about to start down a ski run. The conventional strap arrangements have the problem of not being sufficiently easy to operate, so adjustment
- 25 of the snowboard binding can be difficult. In addition, conventional snowboard binding strap configurations have experienced difficulties in retaining the straps snugly against the snowboarder's boot without loosening during use, or attempting to further tighten the straps over the snowboard boot.

30 Summary of the Invention

- The present invention provides a snowboard binding with a binding frame, an adjustable boot retention member connected to the binding frame and a buckle attached to the boot retention member that is easy to use and adjust during use of a snowboard. The buckle securely retains the boot retention member in a selected
- 35 tightened position and avoids inadvertent loosening of the boot retention member during use. One embodiment of the snowboard binding of the present invention includes a binding frame and first and second boot retaining members that are connected to the

binding frame and removably connectable to each other. The first boot retaining member has a mounting portion attached to a first side portion of the binding frame and has a first free end opposite the mounting portion. The second boot retaining member has a mounting portion attached to the second side portion of the binding frame and has a second free end portion that is positionable adjacent to the free end portion of the first boot retaining member. The first boot retaining member has a plurality of ratchet teeth that form at least a portion of an upper surface of the first boot retaining member. Each of the ratchet teeth has an inclined surface and a driving surface that meet at a peak. A buckle is attached to the free end portion of the second boot retaining member, and the buckle is releasably attachable to the first boot retaining member.

The buckle includes a bracket secured to the second boot retaining member. The bracket has a first bracket end portion positioned toward the free end portion of the second boot retaining member, and a second bracket end portion positioned toward the mounting portion of the second boot retaining member. A lever is pivotally movable relative to the bracket between a lowered position and a raised position. The lever has a first lever end portion pivotally connected to the bracket and a second lever end portion opposite the first lever end portion and sized for grasping by the snowboarder.

A dog member is pivotally movable relative to the lever between a retracted position when the lever is in the raised position, and an advanced position when the lever is in the lowered position. The dog member has a first dog end pivotally attached to the lever and a second dog end opposite the first dog end that engages the ratchet teeth of the first boot retaining member. The second dog end is moved toward the second bracket end portion and the dog member is moved from the retracted position toward the advanced position as the lever is moved from the raised position toward the lowered position. The second dog end is moved toward the first bracket end portion and the dog member is moved from the advanced position toward the retracted position as the lever is moved from the lowered position toward the raised position.

The second dog end is held in engagement with the driving surface of one of the ratchet teeth. The second dog end presses on the ratchet tooth and moves the first boot retention strap relative to the bracket toward the second bracket end portion and the dog member moves toward the advanced position as the lever is moved from the raised position toward the lowered position. When the lever is moved from the lowered position to the raised position the dog member is moved toward the retracted position, and the second dog end moves along the inclined surface of a second one of the ratchet teeth. The second dog end is moved over the peak of the second ratchet tooth and into engagement with the tooth's driving surface. Accordingly, the buckle incrementally

moves the first boot retaining member relative to the bracket and relative to the second boot retaining member to tighten the first and second retaining members about the boot of the snowboarder.

5 A pawl is pivotally connected to the bracket and has a tooth-engaging portion that engages a third ratchet tooth. The pawl is pivotable relative to the bracket and to the first boot retaining member between a retaining position and a released position. The tooth-engaging portion of the pawl engages the driving side of a third one of the ratchet teeth when the pawl is in the retained position and prevents the first boot retaining member from moving relative to the bracket toward the first bracket end portion. When the pawl is pivoted toward the released position the tooth-engaging portion of the pawl is moved out of engagement with the driving surfaces of the ratchet teeth allowing the first boot retaining member to move toward the first bracket end portion, thereby loosening the first and second boot retaining members about the boot of the snowboarder.

15 In an alternate embodiment of the snowboard binding of the present invention, the buckle includes a latch that is attached to the lever and that releasably engages a latch-retaining member on the bracket at the second bracket end portion. The latch is pivotally movable between a latched position and an unlatched position. The latch has a hook portion that releasably engages the latch-retaining member of the bracket when the lever is in the lowered position and the latch is in the latched position to retain the lever in the lowered position. The lever has a release aperture therein, and the release member partially extends through the release aperture when the latch is in the latched position.

25 The latch is pivotally movable from the latched position to the unlatched position by depressing the release member at least partially through the aperture toward the bracket. When the latch is moved toward the unlatched position, the hook portion is pivoted out of engagement with the latch-retaining member to allow the lever to move from the lowered position toward the raised position.

30 In another alternate embodiment of the present invention, the lever has a pawl-engaging surface on the first lever end portion and the lever is pivotally movable relative to the bracket from the raised position, away from the lowered position, and toward a released position. The pawl has a lever mating surface adjacent to the pawl-engaging surface of the lever. The pawl-engaging surface of the lever is pressed against the lever-engaging surface of the pawl as the lever is moved from the raised position toward the released position, to pivot the pawl from the retaining position toward the released position. A pawl biasing member is connected to the pawl and to the bracket to

bias the pawl toward the retaining position. The biased pawl also biases the lever from the released position toward the raised position.

Brief Description of the Drawings

5 Figure 1 is a rear isometric view of a snowboard binding in accordance with the present invention, the binding having an ankle strap with a buckle, shown in a closed position, and a backplate, shown in phantom lines for purposes of clarity.

 Figure 2 is an enlarged top isometric view of the buckle of Figure 1, the buckle being shown in an open position.

10 Figure 3 is a cross sectional view taken substantially along line 3-3 of Figure 2 showing a lever of the buckle in a raised position in solid lines, and showing the lever in a partially closed, strap-advancing position in phantom lines.

 Figure 4 is a cross sectional view of the buckle of Figure 3 showing the buckle in a partially open position.

15 Figure 5 is a cross sectional view of the buckle of Figure 3 showing the lever of the buckle in a release position with a pawl and dog member being out of engagement with the ratchet teeth of a binding strap.

 Figure 6 is an enlarged cross sectional view taken substantially along line 6-6 of Figure 1 showing the snowboard binding buckle in a latched position in solid lines, and in a unlatched position in phantom lines.

20 Figure 7 is an alternate embodiment of the buckle of Figure 6 with a friction latch and latch pin configuration.

Detailed Description of the Invention

25 A snowboard binding 10 in accordance with the present invention is shown in the drawings for purposes of illustration. As best seen in Figure 1, the snowboard binding 10 is of the type which removably receives a boot (not shown) of a snowboarder. The binding includes a binding frame 12 that is attachable to an upper side of a snowboard (not shown), an adjustable toe strap 14 attached to a forward
30 portion 16 of the binding frame, and an adjustable ankle strap 18 attached to a contoured heel brace 20 that defines a rear portion 22 of the frame. The binding 10 has a back plate 24, shown in phantom lines for purposes of clarity, that is attached to the heel brace 20 to provide support for the back of the snowboard boot during use of the binding. The toe strap 14 has a first strap portion 23 and a second strap portion 25
35 securely attached to opposite sides of the front portion 16 of the binding frame. The ankle strap 18 includes a first strap portion 26 and a second strap portion 28 fastened to opposite sides of the heel brace 20. The first and second strap portions 26 and 28 are

releasably connected to each other such that the strap portions can be separated to allow a boot of a snowboarder to fit into or be released from the binding 10. The toe and ankle straps 14 and 18 are adjustable to snugly retain snowboard boots of different sizes within the binding with a force selected by the snowboarder.

5 The binding 10 includes a buckle 30 attached to the second strap portion 28 and the buckle releasably receives the first strap portion 26 therein. The buckle 30 is a ratchet-type buckle and the first strap 26 portion has a plurality of ratchet teeth 32 thereon which the buckle engages to securely retain the first and second strap portions 26 and 28 together at a selected position, or to tighten the ankle strap 18 across the top
10 of the snowboarder's boot until a desired fit is achieved. The buckle 30 releasably retains the first strap portion 26 therein to allow the first and second strap portions 26 and 28 to be separated from each other to allow the snowboard boot to be received by or removed from the binding.

15 The illustrated embodiment shows toe and ankle straps 14 and 18, connected to the binding frame 12. Alternate styles of boot retaining members connected to the binding frame and releasably connected to each other may be used in order to releasably retain the boot of a snowboarder within the binding.

 As best seen in Figure 1, the binding frame 12 has a left side portion 34 and a right side portion 36 opposite the left side portions at the rear portion 22 of the
20 frame. The first strap portion 26 of the ankle strap 18 has a mounting portion 38 pivotally fastened to the heel brace 20 at the left side portion 34, and a free end portion 44 that is positionable adjacent to the second strap portion 28. The second strap portion 28 has a mounting portion 40 fastened to the heel brace at the right side portion 36 substantially opposite the first mounting portion, and a second free end portion 42
25 opposite the second mounting portion. The mounting portions 38 and 40 are fastened to the heel brace 20 at a position generally corresponding to the area of a snowboarder's ankle when the snowboarder's boot is in the binding 10 to allow the ankle strap 18 to pivot about the mounting portions without restricting flexure of the snowboarder's ankle.

30 The buckle 30 is attached to the second free end portion 42 of the second strap portion 28. The buckle 30 removably receives the first free end portion 44 of the first strap portion 26 therethrough. The buckle 30 is movable between a closed position illustrated in Figure 1, and an open position illustrated in Figure 2. In the closed position, the first strap portion 26 is securely engaged by the buckle 30 to prevent the
35 first strap portion from moving through the buckle relative to the second strap portion 28. When the buckle 30 is in the open position, the position of the first strap portion 26

is adjustable relative to the second strap portion 28 to tighten or loosen the ankle strap about the snowboarder's boot.

As best seen in Figure 2, the buckle 30 includes a base bracket 50 fixedly connected to the free end portion 42 of the second strap portion 28. The bracket 50 is an elongated, generally U-shaped member having a web portion 52 fastened to the free end portion 42, and opposing first and second bracket flanges 54 and 56, respectively. The first and second bracket flanges 54 and 56 are integrally connected to the web portion 52 and project away from the free end portion 42. The first and second bracket flanges 54 and 56 are spaced apart to receive a selected portion of the first strap portion 26 therebetween with a downward side of the first strap portion being immediately adjacent to the web portion 52.

The bracket 50 has a first bracket end portion 58 positioned toward a free end of the free end portion 42 of the second strap portion 28, and a second bracket end portion 60 opposite the first bracket end portion and positioned toward the mounting portion 40, such that a longitudinal axis of the bracket is substantially aligned with a longitudinal axis of the second strap portion 28. In the preferred embodiment, the bracket 50 is fastened to the free end portion 42 of the second strap portion 28 by rivets or other suitable fastening means to ensure that the bracket does not separate from the ankle strap during use of the snowboard binding 10. In one embodiment, the bracket 50 is constructed of anodized aluminum, although other durable and rigid material can be used.

As best seen in Figures 1, 2, and 3, the buckle 30 includes a lever 62 having a first lever end portion 64 positioned between the first and second bracket flanges 54 and 56 at the first bracket end portion 58. The first lever end portion 64 has a lever pivot pin 66 spanning between the first and second bracket flanges 54 and 56, and the lever pivot pin extends into opposing lever pivot apertures 68 in the first and second bracket flanges 54 and 56. The lever 62 is pivotally movable about the lever pivot pin 66 between a lowered position, illustrated in Figure 1, and a raised position, illustrated in Figures 2 and 3 in solid lines.

The lever 62 has a second lever end portion 70 opposite the first lever end portion 64, and an intermediate lever portion 72 between the first and second lever end portions. When the lever 62 is in the lowered position, the first lever end portion 64 is generally flush with the top edges of the first and second bracket flanges 54 and 56, and the intermediate lever portion 72 projects upward at an angle away from the first and second bracket flanges 54 and 56 and away from the first bracket end portion 58. In the illustrated embodiment, the intermediate lever portion 72 has an arcuate shape and is integrally formed with the first and second lever end portions 64 and 70. The second

lever end portion 70 extends from the intermediate lever portion 72 and defines a lip adapted to be grasped by the snowboarder to move the lever 62 between the raised position and the lowered position.

As best seen in Figure 2, the first lever end portion 64 has a shallow, generally inverted U-shaped cross section formed by a lever web 74 and a pair of opposing lever flanges 78 that are integrally connected to the lever web and that extend downward from the lever web. The lever web 74 and the lever flanges 78 are positionable between the first and second bracket flanges 54 and 56 when the lever is in the lowered position. The lever web 74 and the lever flanges 78 define a dog receiving area 82 in an underside 80 of the lever 62 between the lever flanges.

As best seen in Figures 2 and 3, the buckle 30 includes a dog member 84 having a first dog end 86 that is positioned in the dog receiving area 82 and pivotally connected to the lever flanges 78. The dog member 84 has a driving end 88 opposite the first dog end 86, and the driving end engages the ratchet teeth 32 on the first strap portion 26. The first dog end 86 has a pivot pin 90 extending therethrough between the lever flanges 78, and extending into pivot apertures 92 in the lever flanges. The dog member 84 is pivotally movable relative to the lever 62 between a retracted position, shown in Figure 3 in solid lines when the lever is in the raised position, and an advanced position, as best shown in Figure 6, when the lever is in the lowered position. Accordingly, the driving end 88 of the dog member 48 is moved relative to the bracket 50 toward the second bracket end portion 60 as the lever 62 is moved from the raised position of Figure 3 toward the lowered position of Figure 6 and as the dog member 84 moves from the retracted position toward the advanced position.

As best seen in Figure 3, each of the ratchet teeth 32 have an upright, flat drive surface 94 and an inclined surface 96 that intersect at a peak 98 of the respective ratchet tooth. When the dog member 84 is in the retracted position of Figure 3, with the lever 62 in the raised position of Figure 3, the driving end 88 is held in engagement with at least a portion of the driving surface 94 of one of the ratchet teeth. As the lever 62 is moved from the raised position toward the lowered position illustrated in phantom lines in Figure 3, the dog member 84 pivots about the pivot pin 90 toward the advanced position of Figure 6 and the driving end 88 moves toward the second bracket end portion 60. The driving end 88 presses against the driving surface 94 and drives the engaged ratchet tooth toward the second bracket end, resulting in relative movement between the first and second strap portions 26 and 28.

As the driving end 88 moves back toward the first bracket end portion 58 when the lever 62 is moved back toward the raised position, the dog member 48 is moved from the advanced position back toward the retracted position. As best seen in

Figure 4, the driving end 88 of the dog member 48 slides along the inclined surface 96 of at least one of the next adjacent ratchet teeth, and the dog member is moved toward the retracted position without driving the ratchet teeth 32 toward the first bracket end portion 58 as the lever 62 is moved toward the raised position. The driving end 88
5 moves along the inclined surface 96 until the driving end reaches the peak 98 of the ratchet tooth, and the driving end drops downward into engagement with at least a portion of the driving surface 94 of that ratchet tooth.

In the illustrated embodiment of the present invention, the driving end 88 travels over only one inclined surface 96 of a ratchet tooth as the lever 62 moves from
10 the lowered position to the raised position, such that the lever and dog member 84 have a one-tooth throw. In an alternate embodiment, the driving end 88 may travel over the inclined surfaces of two or more adjacent ratchet teeth as the lever moves from the lowered position to the raised position, such that the lever and dog member 84 have a two or greater tooth throw. The lever 62 and dog member 84 can be constructed to
15 have increased throw if such action is desired.

As best seen in Figure 4, the buckle 50 has a dog biasing spring 100 that biases the dog member 84 toward the retracted position. The dog biasing spring 100 is a coil spring that is positioned generally in the dog receiving area 82 between the lever flanges 78 and the dog pivot pin 90 extends through a central portion 101 of the coil.
20 The dog biasing spring has a first leg portion 102 bearing against the lever web 74 and a second leg portion 104 bearing against a central support portion 107 of the dog member located between the first dog end 86 and the driving end 88.

The dog biasing spring 100 biases the dog member 84 toward the retracted position such that the dog biasing spring keeps the driving end 88 biased into
25 engagement with the ratchet teeth 32 as the lever 62 is moved between the lowered position and the raised position. Accordingly, the driving end 88 snaps downwardly into engagement with a driving surface 94 of the ratchet tooth after traveling over the inclined surface 96 of one of the ratchet teeth and past its peak 98 as the dog member 84 is moved toward the retracted position.

As the dog biasing spring 100 biases the dog member 84 toward the retracted position, the biasing spring and dog member also exert an upward force on the lever 62 and bias the lever toward the raised position. Accordingly, the lever 62 is movable relative to the bracket 50 in a pumping manner by the snowboarder exerting a downward force on the lever and moving it to the lowered position, and by the
30 snowboarder then allowing the spring force of the dog biasing spring 100 to bias the dog member 84 downward and thereby apply an opposite upward force on the lever to return the lever to the raised position automatically. Such a biased lever configuration
35

results in increased speed and ease for quickly tightening the first and second strap portions 26 and 28 to securely engage and retain the boot of the snowboarder within the binding.

The lever 62 is further pivotally movable about the lever pivot pin 66 between the raised position shown in Figure 3 in solid lines, and a released position, shown in Figure 5. In such manner the raised position of Figure 3 is an intermediate position of the lever 62 between the lowered position of Figure 6 and the raised position of Figure 3. When the lever 62 is moved from the raised position toward the released position by the snowboarder, the lever lifts the dog member 84 relative to the bracket 50 and to the first strap position 26 therein. When moved to the raised position, the driving end 88 of the dog member 84 is lifted away from the ratchet teeth 32 and out of engagement with the driving surfaces 94 of the ratchet teeth. When the lever 62 is in the released position, the first strap portion 26 is permitted to freely move relative to the second strap portion 28 or relative to the bracket 50, unimpeded by the dog member 84. Accordingly, the first and second strap portions 26 and 28 can be loosened or separated from each other, as desired. As the lever 62 is moved downward from the released position toward the raised position, the driving end 88 of the dog member 84 is moved back into engagement with one of the ratchet teeth 32. Thereafter, the lever 62 can be moved between the raised and lowered positions to incrementally advance the first strap portion 26 through the bracket 50 as the dog member 48 is correspondingly moved between the retracted and advanced positions so as to tighten the ankle strap 18 about the boot of the snowboarder.

As best seen in Figure 2, the buckle 30 has a pawl 110 pivotally connected to the bracket 50 adjacent to the first lever end portion 64 of the lever 62 and positioned between the first and second bracket flanges 54 and 56. The first and second bracket flanges 54 and 56 have opposing pawl pivot apertures 112 therein, and a pawl pivot pin 114 spans between the first and second bracket flanges 54 and 56 and extends into the pawl pivot apertures. The pawl 110 pivotally moves about the pawl pivot pin 114 relative to the first strap portion 26 between a strap-retaining position, shown in Figures 3 and 4, and a strap-release position, shown in Figure 5. When the pawl 110 is in the strap-retaining position, as shown in Figure 3, a tooth-engaging portion 116 of the pawl engages one of the ratchet teeth 32. As best seen in Figures 3 and 4, the tooth-engaging portion 116 extends toward the second bracket end portion 60 and terminates below the lever pivot pin 66. The tooth-engaging portion 116 engages the drive surface 94 of one of the ratchet teeth 32 and prevents movement of the first strap portion 26 toward the first bracket end portion 58 as the lever 62 is moved between the lowered and raised positions.

When the lever 62 is moved from the raised position toward the lowered position and the driving end 88 of the dog member 84 drives the first strap portion 26 relative to the bracket toward the second bracket end portion 60, the tooth-engaging portion 116 of the pawl 110 travels along the inclined surface 96 of at least one of the ratchet teeth 32 and eventually drops into engagement with the driving surface of the next adjacent ratchet tooth. This occurs before the driving end 88 of the dog member 84 reaches the full end travel of its movement toward the second bracket end portion 60 when the lever 62 is in the lowered position. When the lever 62 is moved from the lowered position upward to the raised position, the tooth-engaging portion 116 of the pawl 110 engages the driving surface 94 of the engaged ratchet tooth and prevents the first strap portion 26 from moving relative to the bracket 50 toward the first bracket end portion 58 as the dog member 84 is moved over the inclined surface of the ratchet tooth in preparation for engaging and driving the next driving surface 94.

When the lever 62 is in the lowered position, as shown in Figure 6, the tooth-engaging portion 116 of the pawl 110 engages the driving surface 94 of one ratchet tooth 32, the driving end 88 of the dog member 84 engages the driving surface 94 of another ratchet tooth such that the driving end 88 of the dog member and the tooth-engaging portion of the pawl work together to prevent the first strap portion 26 from moving relative to the bracket 50 toward the first bracket end portion 58. Accordingly, when the lever 62 is moved between the raised and lowered positions, the first strap portion 26 moves through the bracket 50 toward the second bracket end portion 60, and the pawl 110 and the dog member 84, working together, to block the first strap portion from moving in the opposite direction, thereby allowing the ankle strap 18 to be incrementally tightened without the ankle strap loosening between strokes of the lever.

As best seen in Figures 3 and 4, the bracket 50 has a pawl biasing spring 122 that biases the pawl 110 toward the strap-retaining position shown in solid line in Figures 3, 4, and 6. The pawl biasing spring 122 is a coil spring with a first leg 124 positioned within a retaining notch 126 in the first bracket flange 54 and bearing against the first bracket flange. A second leg 128 of the pawl bears against the tooth-engaging portion 116 of the pawl 110 to bias the pawl toward the strap-retaining position. The pawl biasing spring 122 has the pawl pivot pin 114 extending through a central opening of the spring. As the lever 62 is moved from the raised position toward the lowered position and the tooth-engaging portion 116 travels over the incline surfaces 96 and past the peak 94 of a ratchet tooth, the pawl biasing spring 122 biases the tooth-engaging portion downwardly against the ratchet tooth, such that when the tooth-engaging

portion 16 reaches the driving surface 94 of the ratchet tooth, it snaps into the strap-retaining position.

As best seen in Figure 6, the pawl 110 has a lever-engaging surface 118 that is adjacent to a pawl-engaging surface 120 at the first lever end portion 64 of the lever 62 at a location generally above the lever pivot pin 66. The pawl-engaging surface 120 of the lever 62 is moved into engagement with the lever-engaging surface 118 of the pawl 110 when the lever 62 is moved from the raised position toward and into the released position as shown in Figure 5. As a result of this engagement, the pawl 110 is pivoted about the pawl pivot pin 114 toward the strap-release position, and the tooth-engaging portion 116 is lifted away from the ratchet teeth 32. Similarly, when the lever 62 is in the released position, the dog member 84 is out of engagement with the ratchet teeth 32, and hence the first strap portion 26 is free to move relative to the bracket toward the first bracket end portion 58 so as to loosen the ankle strap 18 and separate the first and second strap portions 26 and 28, if desired. When the lever 62 is in the released position and the pawl 110 is in the strap-release position, the first strap portion 26 may also be moved freely through the brackets toward the second bracket end portion 60 in order to quickly tighten the ankle strap 18 without resistance from either the dog member 84 or the pawl 110.

As noted above, the pawl biasing spring 122 biases the pawl toward the strap-retaining position. Since when the pawl 110 is in the released position, the lever-engaging surface 118 of the pawl presses against the pawl-engaging surface 120 of the lever 62, the pawl biasing spring acts to bias the lever 62 to move from the released position toward the raised position when the snowboarder stops pulling upward on the lever 62 and does not resist the biasing force.

As best seen in Figure 2, the bracket 50 has a first latching tab 130 connected to an upper edge portion 134 of the first bracket flange 54 at the second bracket end portion 60, and a second latching tab 132 connected to the upper edge portion of the second bracket flange 56 opposite the first latching tab. The first and second latching tabs 130 and 132 extend from the respective first and second bracket flanges 54 and 56 toward each other and generally parallel to the web 52 of the bracket 50. As such, the first and second latching tabs 130 and 132 are substantially coplanar and at a position spaced above the first strap portion 26 when within the bracket 50.

The buckle 30 has a latch member 136 attached to the lever 62, for releasably engaging the first and second latching tabs 130 and 132 when the lever is fully moved to the lowered position. The latch member 136 releasably retains the lever 62 in the lowered position, as best seen in Figure 6. The second lever end portion 70 of the lever 62 has a pair of spaced apart flanges 138 that are positioned above the first and

second latching tabs 130 and 132 when the lever 62 is in the lowered position. The latch member 136 is positioned between the flanges 138. The flanges 138 have opposing latch pivot apertures 140 retaining the respective ends of a latch pivot pin 142 therein. The latch member 136 is pivotally mounted on the pivot pin 142 and movable relative to the lever 62 between a latched position shown in Figure 6 in solid lines, and an unlatched position, shown in phantom lines in Figure 6.

The latch member 136 has latch mounting ears 144 positioned between the flanges 138, with the latch pivot pin 142 extending through the latch mounting ears. The latch member 136 also has a hook portion 146 spaced away from the latch mounting ears 144 and positioned to releasably engage the first and second latching tabs 130 and 132 when the lever 62 is in the lowered position and the latch member is in the latched position. The intermediate lever portion 72 of the lever 62 has an enlarged central aperture 150 formed therethrough. The latch member 136 has a release button portion 148 connected to the latch mounting ears 144 and partially extends upward through the aperture 150 such that the release button portion is accessible from above the lever 62.

The release button portion 148 protrudes through the aperture 150 and above lever 62, and the hook portion 146 is located below the flanges 138 with a space 151 therebetween. The space 151 is sized to receive the first and second latching tabs 130 and 132 therein when the lever 62 is in the fully lowered position. The latch member 136 is pivoted about the latch pivot pin 142 from the latched position, shown in solid lines in Figure 6, to an unlatched position, shown in phantom lines in Figure 6, upon the snowboarder exerting a downward force on the release button portion 148 and thereby rotating the latch member 136 counterclockwise as viewed in Figures 3-6 and pivoting the hook portion 146 away from engagement with the first and second latching tabs 130 and 132 as shown in solid line in Figure 6 to a disengaged position as shown in phantom line in Figure 6 such that the locking tabs do not obstruct movement of the lever 62 from moving from the lowered position toward the raised position.

The latch member 136 has a latch biasing spring 152 that biases the latch member toward the latched position. The latch biasing spring 152 has a first leg 154 bearing against an underside of the lever 62 and a second leg 156 bearing against a portion of the latch member between the latch mounting ears 144. Accordingly, the latch member 136 returns to the latched position relative to the bracket 50 when the downward force exerted by the snowboarder on the release button portion 148 is removed.

As best seen in Figures 3 and 6, the hook portion 146 of the latch member 136 has an inclined tab-engaging surface 160 that slopes from a bottommost

portion 162 of the hook portion 146 upwardly toward the release button portion 148. The inclined tab-engaging surface 160 is shaped to engage the first and second latching tabs 130 and 132 when the lever 62 is moved from the raised position toward the lowered position. The inclined tab-engaging surface 160 slides over a leading edge 164 of the first and second latching tabs 130 and 132 causes the latch member 136 to pivot about the latch pivot pin 142 in a counterclockwise direction as viewed in Figures 3 and 6 from the latched position toward the unlatched position until a rearwardmost point 166 of the hook portion 146 is clear to pass by the first and second latching tabs 130 and 132. After the rearwardmost portion 166 of the hook portion 146 passes the locking tabs, the latch biasing spring 152 biases the latch member 136 to return to the latched position with the hook portion 146 being under the first and second latching tabs 130 and 132. As such, the hook portion 146 prevents the lever 62 from being lifted from the lowered position toward the raised position until the release button portion 148 is again depressed by the snowboarder.

The latch biasing spring 152 has a spring constant selected to provide sufficient resistance to unintended pivotal movement of the latch member 136 into the unlatched position while providing sufficient force to allow the latch member to pivot and move over the first and second latching tabs 130 and 132 and then into the latched position with the hook portion 146 therebelow by the snowboarder pressing downward on the second lever end portion 70 with the snowboarder's hand.

In the illustrated embodiment of the latch member 136, the latch mounting ears 144, the hook portion 146 and the release button portion 148 are formed integrally as a single molded part.

As best seen in Figure 7, an alternate embodiment of the present invention includes a buckle 170 with a bracket 172 having a latch pin 174 extending between opposing first and second bracket flanges 175 (only the second bracket flange being shown in Figure 7). The latch pin 174 extends into latch pin apertures 176 formed in an upper portion 177 of each bracket flange 175. Accordingly, the latch pin 174 is positioned above the first strap portion 26. The buckle 170 has the lever 62 pivotally connected to the bracket 172 as discussed above. The lever 62 has a pair of deflectable detent hooks 178 extending downward from the second lever end portion 70. The detent hooks 178 each have a pin-receiving areas 182 therein that are shaped and sized to receive a portion of the latch pin 174 when the lever 62 is in the lowered position.

The detent hooks 178 are sufficiently resilient such that the detent hooks 178 retain the lever 62 in the lowered position by frictional engagement with the latch pin 174. The detent hooks 178 are preferably durable plastic members, although they could be made of other durable and deflectable material. The lever 62 is moved

from the lowered position toward the raised position by the snowboarder exerting a sufficient upward force on the second end portion 70, in the direction away from the bracket 172, so as to overcome the frictional resistance between the detent hooks and the latch pin and deflect the detent hooks 178 forward and allow them to pass around a
5 forward side of the latch pin 174.

The lever 62 is moved from the raised position to the lowered position by pressing on the second free end 70 of the lever 62 so that the detent hooks 178 are pressed into engagement with the latch pin 174, and deflected away from the latch pin 174 until the latch pin is adjacent to the pin-receiving area 182. Then the latch
10 hooks 178 snap into engagement with the latch pin 174 so that the latch pin is within the pin-receiving area 182. The movement of the lever 62 between the lowered, raised, and released positioned, and the resulting movement of the dog member 84 and the pawl 110 are as discussed above for the embodiment of Figures 1-6.

While various embodiments have been described in this application for
15 illustrative purposes, the claims are not limited to the embodiments described herein. Equivalent devices may be substituted for those described, which operate according to the principles of the present invention, and thus fall within the scope of the claims. Therefore, it is expressly to be understood that the modifications and variations and equivalents thereof made to the snowboard binding disclosed herein may be practiced
20 while remaining within the spirit and scope of the invention as defined in the following claims.

Claims

I Claim:

1. A snowboard binding of the type that removably receives a boot of a snowboarder, comprising:

a binding frame having first and second side portions;

first and second boot retaining members connected to the binding frame and removably connected to each other, the first boot retaining member having a first mounting portion attached to the first side portion of the binding frame and having a first free end portion, the second boot retaining member having a second mounting portion attached to the second side portion of the binding frame and having a second free end portion positionable adjacent to the first free end portion, the first boot retaining member having a plurality of ratchet teeth each having an inclined surface and a driving surface; and

a buckle attached to the second boot retaining member and releasably attachable to the first boot retaining member, the buckle including:

a bracket secured to the second boot retaining member, the bracket having first and second bracket end portions, the first bracket end portion being positioned toward the second free end portion and the second bracket end portion being positioned toward the second mounting portion,

a lever pivotally movable relative to the bracket between a lowered position and a raised position, the lever having a first lever end portion pivotally connected to the bracket, and having a second lever end portion opposite the first lever end portion, and sized for grasping by the snowboarder,

a dog member pivotally movable relative to the lever between a retracted position when the lever is in the raised position and an advanced position when the lever is in the lowered position, the dog member having a first dog end pivotally attached to the lever and having a second dog end opposite the first dog end that engages the ratchet teeth of the first boot retaining member, the second dog end being moved toward the second bracket end portion and the dog member being moved from the retracted position toward the advanced position when the lever is moved from the raised position toward the lowered position, and the second dog end being moved toward the first bracket end portion and the dog member being moved from the advanced position toward the retracted position when the lever is moved from the lowered position toward the raised position, the second dog end being held in engagement with the driving surface of a first one of the ratchet teeth as the lever is

moved from the raised position toward the lowered position to drive the first ratchet tooth toward the second bracket end portion, the second dog end being moved along the inclined surface of at least one of the ratchet teeth toward the first bracket end portion without driving the ratchet teeth toward the first bracket end portion, and the second dog end being moved into position for engagement with the driving surface of a second one of the ratchet teeth as the lever is moved from the lowered position toward the raised position to thereby incrementally move the first boot retaining member relative to the bracket to tighten the first and second boot retaining members about the boot of the snowboarder; and

a pawl pivotally connected to the bracket, the pawl member having a tooth-engaging portion that engages a third one of the ratchet teeth, the pawl being pivotable between a retaining position and a first released position, the tooth-engaging portion of the pawl engaging the driving surface of the third ratchet tooth when the pawl is in the retaining position and preventing the first free end portion of the first boot retaining member from moving toward the first bracket end portion, the tooth-engaging portion of the pawl being out of driving engagement with the driving surfaces of the ratchet teeth when the pawl is in the first released position to allow the first free end portion of the first boot retaining member to move toward the first bracket end portion to loosen the first and second boot retaining members about the boot of the snowboarder.

2. The snowboard binding of claim 1, further including a biasing member that biases the dog member toward the retracted position.

3. The snowboard binding of claim 2 wherein the dog member biases the lever toward the raised position.

4. The snowboard binding of claim 1 wherein the lever is movable relative to the bracket between the raised position and a second released position, the lever member moving the dog member from the retracted position toward a lifted position when the lever moves from the raised position toward the second released position, the second dog end being out of engagement with the driving surfaces of the ratchet teeth

5. The snowboard binding of claim 1, further including a latch-retaining member connected to the second bracket end portion, and a latching portion attached to the

lever, the latching portion being releasably engagable with the latch-retaining member to retain the lever in the lowered position.

6. The snowboard binding of claim 1 wherein the lever has an aperture therein between the first and second lever end portions, the buckle further including a latch-retaining member connected to the second bracket end portion, and a latch member having a latch mounting portion pivotally connected to the lever, the latch member being pivotally movable between a latched position and an unlatched position, the latch member having a hook portion connected to the latch mounting portion, the hook portion releasably engages the latch-retaining member of the bracket when the lever is in the lowered position and the latch member is in the latched position to releasably retain the lever in the lowered position, the latch member having a release member connected to the latch mounting portion, and a portion of the release member extends through the aperture in the lever portion when the latch member is in the latched position, the release member being movable to a depressed position to move the latch member to the unlatched position with the hook portion being out of engagement with the latch member to allow the lever to move from the lowered position toward the raised position.

7. The snowboard binding of claim 6, further including a biasing member connected to the lever and biasing the latch member toward the latched position.

8. A snowboard binding of the type that removably receives a boot of a snowboarder, comprising:

- a binding frame having first and second side portions;

- first and second boot retaining members connected to the binding frame and removably connected to each other, the first boot retaining member having a first mounting portion attached to the first side portion of the binding frame and having a first free end portion opposite the first mounting portion, the second boot retaining member having a second mounting portion attached to the second side portion of the binding frame and having a second free end portion positionable adjacent to the first free end portion, the first boot retaining member having a plurality of ratchet teeth each having an inclined surface and a driving surface; and

- a buckle attached to the second boot retaining member and releasably attachable to the first boot retaining member, the buckle including:

- a bracket secured to the second boot retaining member, the bracket having first and second bracket end portions, the first bracket end portion being

positioned toward the second free end portion and the second bracket end portion being positioned toward the second mounting portion,

a lever pivotally movable relative to the bracket between a lowered position and a raised position and between the raised position and a first released position, the lever having a first lever end portion and a pawl engagement surface adjacent to the first lever end portion and a second lever end portion opposite the first lever end portion and sized for grasping by the snowboarder, the first lever end portion being pivotally connected to the bracket,

a dog member pivotally movable relative to the lever between a retracted position when the lever is in the raised position and an advanced position when the lever is in the lowered position, the dog member having a first dog end pivotally attached to the lever and having a second dog end opposite the first dog end that engages the ratchet teeth of the first boot retaining member, the second dog end being moved toward the second bracket end portion and the dog member being moved from the retracted position toward the advanced position when the lever is moved from the raised position toward the lowered position, and the second dog end being moved toward the first bracket end portion and the dog member being moved from the advanced position toward the retracted position when the lever is moved from the lowered position toward the raised position, the second dog end being held in engagement with the driving surface of a first one of the ratchet teeth as the lever is moved from the raised position toward the lowered position to drive the first ratchet tooth toward the second bracket end portion, the second dog end being moved along the inclined surface of at least one of the ratchet teeth without driving the ratchet teeth toward the first bracket end portion, and the second end of the dog member being moved into position for engagement with the driving surface of a second one of the ratchet teeth as the lever is moved from the lowered position toward the raised position, to thereby incrementally move the first boot retaining member relative to the bracket to tighten the first and second boot retaining members about the boot of the snowboarder; and

a pawl pivotally connected to the bracket, the pawl having a tooth-engaging portion engaging a third one of the ratchet teeth and having a lever-engaging surface adjacent to the pawl-engaging surface of the first lever end portion, the pawl being pivotable between a retaining position and a second released position, the tooth-engaging portion of the pawl engaging the driving surface of the third ratchet tooth when the pawl is in the retaining position and preventing the first free end portion of the first boot retaining member from moving toward the first bracket end portion of

the bracket, the tooth-engaging portion of the pawl being out of driving engagement with the driving surfaces of the ratchet teeth when the pawl is in the second released position to allow the first free end portion of the first boot retaining member to move toward the first bracket end portion to loosen the first and second boot retaining members about the boot of the snowboarder, the lever-engaging surface engaging the pawl-engaging surface of the first lever end portion when the lever is moved from the raised position toward the first released position to pivot the pawl from the retaining position toward the second released position, the pawl having a pawl biasing member attached to the bracket that biases the pawl toward the retaining position.

9. The snowboard binding of claim 8 wherein the pawl member biases the lever from the first released position toward the raised position.

10. The snowboard binding of claim 1 wherein the first and second boot retaining members are straps.

11. The snowboard binding of claim 10 wherein the pawl has a lever-engaging surface adjacent to the lever, and the lever bears against the lever-engaging surface and moves the lever-engaging surface and the tooth-engaging portion away from the first boot retaining member when the lever is moved from the raised position toward the second released position.

12. The snowboard binding of claim 4 wherein the lever has a pawl engaging portion adjacent to the pawl, the pawl engaging portion engages the pawl as the lever is moved from the raised position toward the second released position to move the pawl from the retaining position toward the first released position.

13. The snowboard binding of claim 12 further including a pawl biasing member attached to the pawl and biasing the pawl from the first released position toward the retaining position.

14. The snowboard binding of claim 13 wherein the pawl biases the lever from the second released position toward the raised position.

15. A snowboard binding of the type that removably receives a boot of a snowboarder, comprising:

a binding frame having first and second side portions;

first and second boot retaining members connected to the binding frame and removably connected to each other, the first boot retaining member having a first free end portion and the second boot retaining member having a second free end portion positionable adjacent to the first free end portion, the first boot retaining member having a plurality of ratchet teeth each having an inclined surface and a driving surface; and

a buckle attached to the second boot retaining member and releasably attachable to the first boot retaining member, the buckle including:

a bracket secured to the second boot retaining member, the bracket having first and second bracket end portions, the first bracket end portion being positioned toward the second free end portion and the second bracket end portion being opposite the first bracket end portion,

a lever pivotally movable relative to the bracket between a lowered position and a raised position, the lever having a first lever end portion pivotally connected to the bracket, and having a second lever end portion opposite the first lever end portion, and sized for grasping by the snowboarder,

a tooth-engaging member connected to the lever and movable relative to the lever between a retracted position when the lever is in the raised position and an advanced position when the lever is in the lowered position, the tooth-engaging member having a driving end that engages the ratchet teeth of the first boot retaining member, the driving end being moved toward the second bracket end portion as the tooth-engaging member is moved from the retracted position toward the advanced position when the lever is moved from the raised position toward the lowered position, and the driving end being moved toward the first bracket end portion as the tooth-engaging member being moved from the advanced position toward the retracted position when the lever is moved from the lowered position toward the raised position, the driving end being held in engagement with the driving surface of one of the ratchet teeth as the lever is moved from the raised position toward the lowered position to

drive the one ratchet tooth toward the second bracket end portion to incrementally move the first boot retaining member relative to the bracket to tighten the first and second boot retaining members about the boot of the snowboarder,

a latch-retaining member connected to the second bracket end portion,
and

a latching portion attached to the lever, the latching portion being releasably engagable with the latch-retaining member to retain the lever in the lowered position.

16. The snowboard binding of claim 15 wherein the lever has an aperture therein between the first and second lever end portions, and the latch member has a latch mounting portion pivotally connected to the lever, the latch member being pivotally movable between a latched position and an unlatched position, the latch member having a hook portion connected to the latch mounting portion, the hook portion being releasably engagable with the latch-retaining member of the bracket when the lever is in the lowered position and the latch member is in the latched position, the latch member having a release member connected to the latch mounting portion, and a portion of the release member extends through the aperture in the lever when the latch member is in the latched position, the release member being movable to a depressed position to move the latch member to the unlatched position with the hook portion being out of engagement with the latch member to allow the lever to move from the lowered position toward the raised position.

17. A snowboard binding of the type that removably receives a boot of a snowboarder, comprising:

a binding frame;

first and second boot retaining members connected to the binding frame and removably connected to each other, the first boot retaining member having a first free end portion, the second boot retaining member having a second free end portion positionable adjacent to the first free end portion, the first boot retaining member having a plurality of ratchet teeth each having an inclined surface and a driving surface; and

a buckle attached to the second boot retaining member and releasably attachable to the first boot retaining member, the buckle including:

a bracket attached to the second boot retaining member, the bracket having first and second bracket end portions, the first bracket end portion being positioned toward the second free end portion and the second bracket end portion being opposite the first bracket end portion,

a lever pivotally movable relative to the bracket between a lowered position and a raised position, the lever having a first lever end portion pivotally connected to the bracket and having a second lever end portion opposite the first lever end portion, the second lever end portion being sized for grasping by the snowboarder,

a dog member pivotally movable relative to the lever between a retracted position when the lever is in the raised position and an advanced position when the lever is in the lowered position, the dog member having a first dog end pivotally attached to the lever and having a second dog end opposite the first dog end that engages one of the ratchet teeth of the first boot retaining member, the second dog end being moved toward the second bracket end portion and the dog member being moved from the retracted position toward the advanced position when the lever is moved from the raised position toward the lowered position, and the second dog end being moved toward the first bracket end portion and the dog member being moved from the advanced position toward the retracted position when the lever is moved from the lowered position toward the raised position, the second dog end being held in position for engagement with the one ratchet tooth as the lever is moved from the raised position toward the lowered position to drive the one ratchet tooth toward the second bracket end portion to incrementally move the first boot retaining member relative to the bracket to tighten the first and second boot retaining members about the boot of the snowboarder, and

a pawl pivotally connected to the bracket, the pawl having a tooth-engaging portion that engages a second one of the ratchet teeth, the pawl being pivotable between a retaining position and a first released position, the tooth-engaging portion of the pawl engaging the driving surface of the second ratchet tooth when the pawl is in the retaining position and preventing the first free end portion of the first

boot retaining member from moving toward the first bracket end portion, the tooth-engaging portion of the pawl being out of driving engagement with the driving surfaces of the ratchet teeth when the pawl is in the first released position to allow the first free end portion of the first boot retaining member to move toward the first bracket end portion to loosen the first and second boot retaining members about the boot of the snowboarder.

18. The snowboard binding of claim 17, further including a biasing member that biases the dog member toward the retracted position.

19. The snowboard binding of claim 18 wherein the dog member biases the lever toward the raised position.

20. The snowboard binding of claim 17 wherein the lever is movable relative to the bracket between the raised position and a second released position, the lever member moving the dog member from the retracted position toward a lifted position when the lever moves from the raised position toward the second released position with the second dog end being out of driving engagement with the ratchet teeth.

21. A snowboard binding of the type that removably receives a boot of a snowboarder, comprising:

- a binding frame;

- first and second boot retaining members connected to the binding frame and removably connected to each other, the first boot retaining member having a first free end portion, the second boot retaining member having a second free end portion positionable adjacent to the first free end portion; and

- a buckle attached to the second boot retaining member and releasably attachable to the first boot retaining member, the buckle including:

- a lever pivotally movable relative to the second boot retaining member between a lowered position and a raised position, the lever being connected to the second boot retaining member,

a driving member pivotally movable relative to the lever between a retracted position when the lever is in the raised position and an advanced position when the lever is in the lowered position, the driving member having a first end connected to the lever and having a second end opposite the first end that engages the first boot retaining member, the second end being moved from the retracted position toward the advanced position when the lever is moved from the raised position toward the lowered position, and the second end being moved from the advanced position toward the retracted position when the lever is moved from the lowered position toward the raised position, the second end being held in engagement with the first boot retaining member as the lever is moved from the raised position toward the lowered position to drive the first free end of the first boot retaining member away from the second free end of the second boot retaining member to tighten the first and second boot retaining members about the boot of the snowboarder, and

a lock member connected to the second boot retaining member, the lock member having an engaging portion that engages the first boot retaining member, the lock member being movable between a locked position and a released position, the engaging portion engaging the first boot retaining member when the lock member is in the locked position and preventing the first free end portion of the first boot retaining member from moving toward the second free end of the second boot retaining member, the engaging portion being out of locking engagement with the first boot retaining member when the lock member is in the released position to allow the first free end portion of the first boot retaining member to move toward the second free end of the second boot retaining member to loosen the first and second boot retaining members about the boot of the snowboarder.

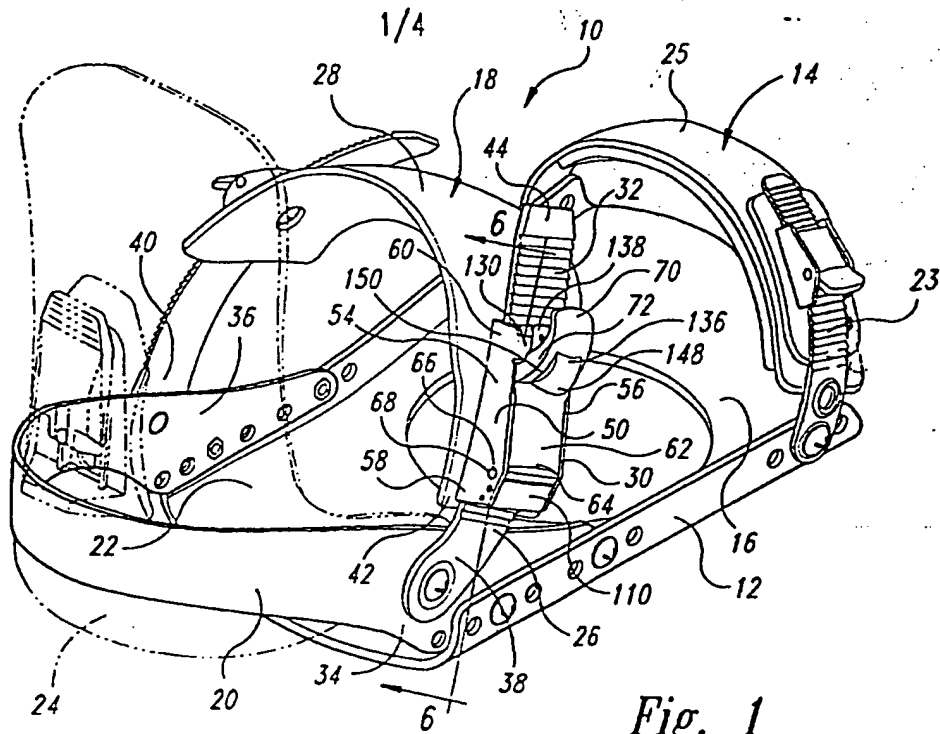


Fig. 1

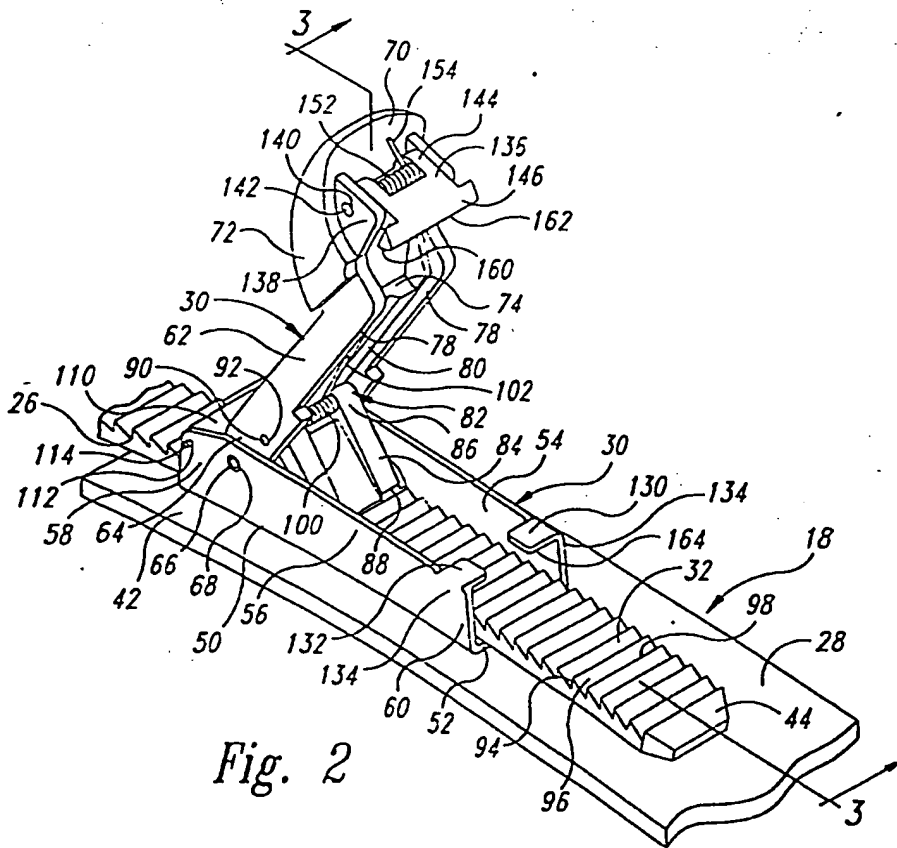


Fig. 2

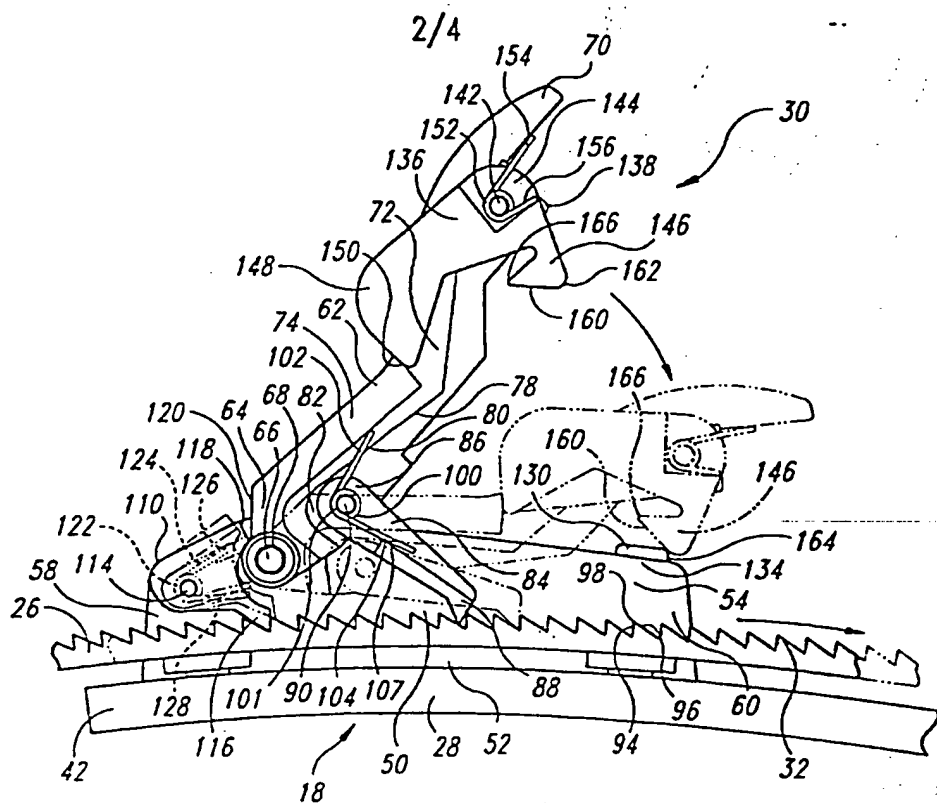


Fig. 3

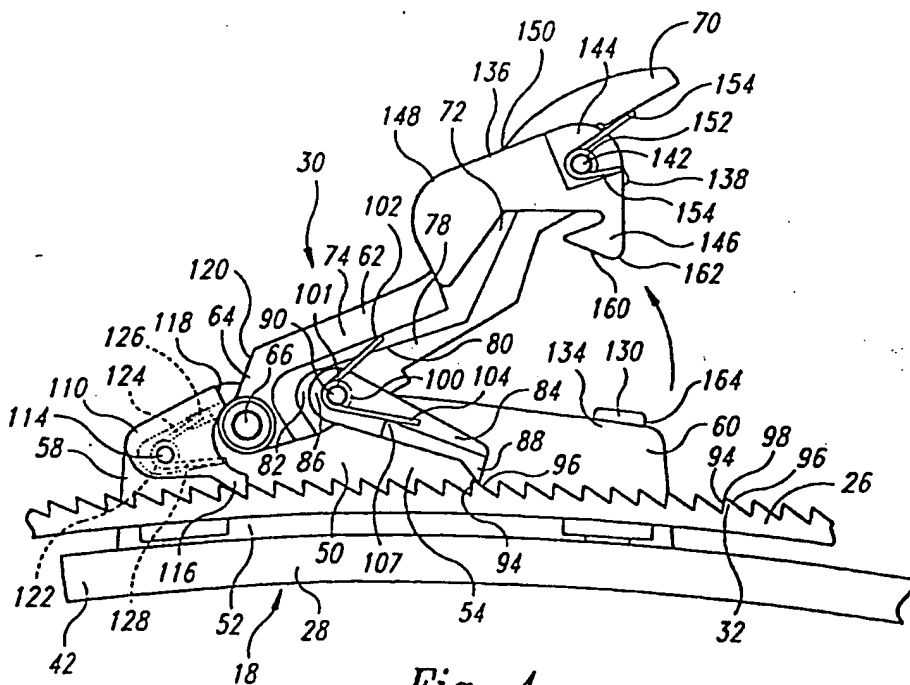
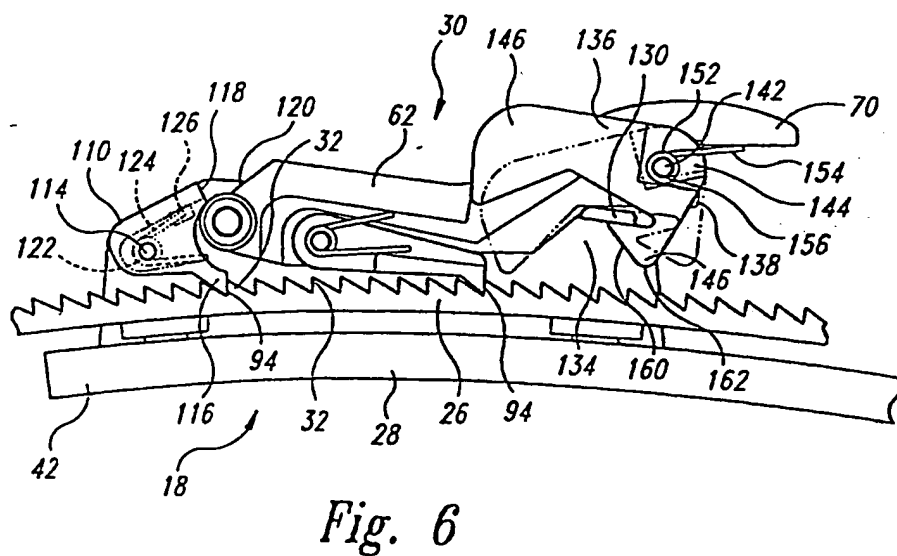
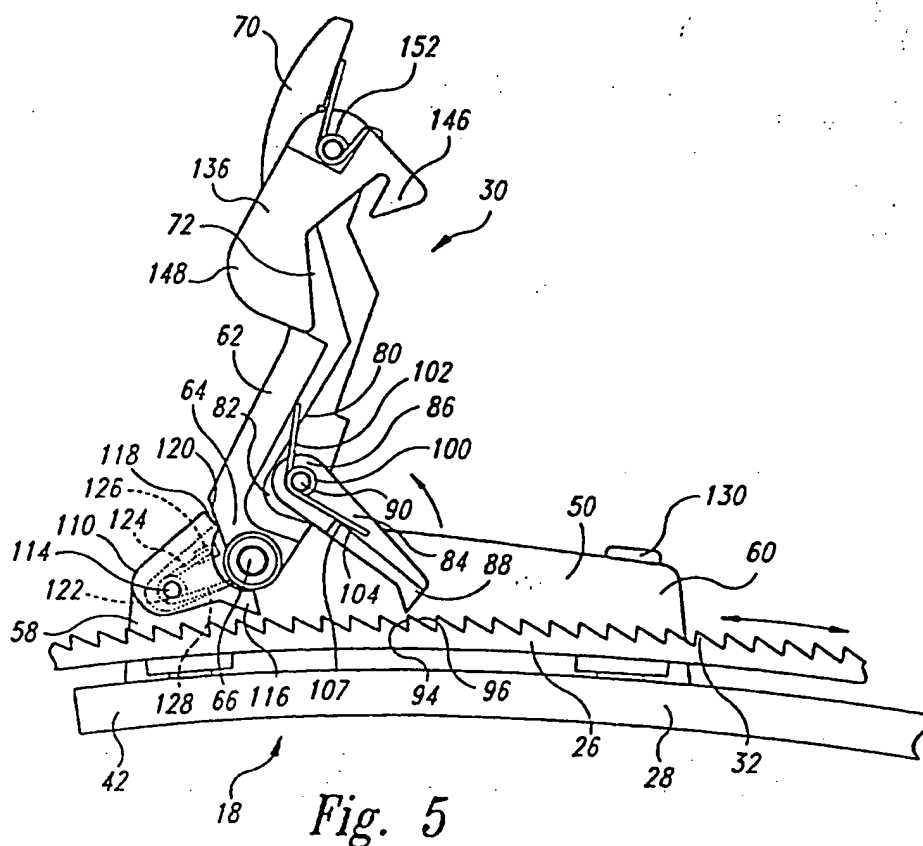


Fig. 4

3/4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/01541

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A63C 9/00
US CL :280/617

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 280/617, 611, 623, 624, 625, 633, 634, 607, 14.2; 24/68SK, 70SK; 441/70; 36/117.1, 117.7, 117.8, 50.5

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NoneElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
None

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3,662,435 A (ALLSOP) 16 May 1972, col. 5, line 40 - col. 6, line 29	1-21
Y	5,409,244 A (YOUNG) 25 April 1995, col. 3, lines 49-68.	1-21
Y	4,193,171 US A (LICHOWSKY) 18 March 1980, col. 6, lines 40-55.	6-7, 15-16
Y	US A 4,424,636 (EVEREST) 10 January 1984, col. 2, line 61 - col. 3, line 27.	6-7, 16

☐ Further documents are listed in the continuation of Box C. - ☐ See patent family annex.

Special categories of cited documents:	
A document defining the general state of the art which is not considered to be of particular relevance	*T* later documents published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
B earlier document published on or after the international filing date	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
O document referring to an oral disclosure, use, exhibition or other means	*Z* document member of the same patent family
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

20 MARCH 1997

Date of mailing of the international search report

04 APR 1997

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